

MATH 2094 Research Project 1

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1 Define a *Knot*

In the topological sense a *knot* can be defined as a continuous, simple closed curve in Euclidean three-space (Livingston 1993).

2 *Reidemeister Move*

A sequence of *Reidemeister moves* as well as an orientation preserving the homeomorphic plane relate two diagrams of equivalent links (Lickorish 2012). There are three types Reidemeister moves which generate all of the possible projections of a knot (Trace 1983). The first type either inserts or deletes 'kinks' in the link while the third type preserves the number of crossings (Lickorish 2012).

3 Knot Theory

Simply put, *knot theory* is the mathematical study of knots. More specifically, an aspect of knot theory is provide the means by which to determine whether or not two knots are equivalent (Murasugi 2007). Although a mathematical concept, knot theory is utilized by a variety of disciplines including biology and chemistry. A common application of knot theory is the study of DNA formation in the biological field (Qiu 2000). A focus in the study of DNA topology is the replication and transcription of DNA. A curve of single-stranded, or double-stranded, DNA in three-dimensional space which begins and ends at the same point yet does not intersect itself allows biologists to consider the strands as DNA knots (Qiu 2000). Knot theory, therefore, is implemented in understanding how the DNA knots are untangled, or un-knotted, by enzymes in the replication and transcription processes (Qiu 2000).

References

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